LASER LEVEL WITH ADJUSTABLE LASER PROJECTION LINE

DESCRIPTION

RELATED APPLICATIONS

This application claims priority from Chinese Application No. 02293048.5, filed on December 27, 2002.

FIELD OF THE INVENTION

The present invention relates to an alignment-product which reflects a line on a surface as a positioning reference, and particularly to a laser level which marks a line on a reference surface with the fanned beam projected by a laser generator.

BACKGROUND OF THE INVENTION

There are many kinds of laser alignment devices, which project laser beams by laser generators to mark lines. One such device is designed by U.S. Tool Co. (U.S. Patent Application Publication No. US2002/0178596A1), which can project a line of fixed orientation. Another such device is marketed by U.S. CTB/Berger, which can project a horizontal line and a plumb line decussate to each other on walls perpendicular to the direction of propagation of the laser. The former can merely project a line parallel to the baseplane of its pedestal; the latter can form two lines vertical with each other, but there is a disadvantage that two laser generators are needed, and as the switch is turned on, required or not, the two laser generators project beams simultaneously, thereby causing much more power consumption.

SUMMARY OF THE INVENTION

It is an object of the present invention to provide a laser level with only one laser generator which can be rotated 90 degrees to alter the location relationship of the laser beam with the base plane of the laser level.

Another object of the present invention is to provide a means to mount the laser level on a metallic surface.

A further object is to provide a separate base plate which can protrude a plurality of retractable pins to suspend and hold the laser level on a surface of plastic, cork, wood, drywall or other soft object.

An even further object of this invention is to provide one or more level bubbles to indicate whether the laser beam is horizontally or vertically level.

To achieve the objects hereinbefore, the laser alignment device of the present invention includes a support bracket, a clamshell housing defined by a left clamshall housing member and a right clamshell housing member, a laser generator, a battery to power the laser generator, a cover for a battery pack, a switch, a protective door and a rotating mechanism. The protective door is used to activate the trigger of the linked switch. The laser generator will be switched off when the door is closed, and the lens of the laser generator will be protected against dust. When the door is opened, the switch connects the laser generator to the power supply and the laser generator will project a fan-shaped laser beam to form a line on a surface.

The rotating mechanism includes a knob which can rotate from 0 to 90 degrees, and which is coupled to the laser generator to rotate the laser generator when the knob is turned, thereby causing rotation of the line on the plane.

There may be a magnetic attachment means on the base of the support bracket. When it is necessary to secure the laser level on a surface of a metallic object (e.g., a pipe or metal

stud) one needs only to place the laser level with adjustable laser projection line onto the metallic object, and the laser level will be held there via the magnetic attachment means. In this manner, the laser level can be positioned on a non-horizontal plane in a realtively secure position, and avoid instability.

The laser level with adjustable laser projection line also includes a separate removable mounting baseplate having two or more retractable pins which can be extended from the removable mounting baseplate and inserted into the wall, wood, plastic or other soft object as desired. When not in use, the pins can retract into a cavity in the removable mounting baseplate.

The laser level with adjustable laser projection line can be powered by an internal battery. The user need only screw the cover off without the aid of a tool to remove the discharged battery cells and fill in new battery cells to power the laser generator.

The laser level can further comprise two conventional level bubbles which are perpendicular to each other on the top of the laser level. The two level bubbles are both parallel to the bottom of the laser level, for orientation or leveling a precise horizontal line or plumb line.

The laser level with adjustable laser projection line disclosed by the present invention can expediently mark a reference line accordingly on a workpiece as needed. The reference line can be parallel, vertical or be adjusted to other angular degrees to the bottom of the laser level.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 illustrates a perspective view of a preferred embodiment of a laser level with adjustable laser projection line according to the present invention;

FIG. 2 is an inner perspective view of the laser level of FIG. 1 with left clamshell

housing member removed;

FIG. 3 is a sectional view of the mechanism for rotating the laser when the mechanism is rotated to its right limit with the laser beam perpendicular to the bottom plate of the laser level;

FIG. 4 is a sectional view of the rotating mechanism when it is rotated to its left limit with the laser beam parallel to the bottom plate of the laser level;

FIG. 5 is a sectional view of the removable base plate;

FIG. 6 is a sectional view of the removable base plate wherein the positioning pins are retracted inside the removable base plate;

FIG. 7 is a sectional view of the removable base plate wherein the positioning pins protrude outward;

FIG. 8 is a perspective view of the laser level with adjustable laser projection line when it is positioned and held on a vertical plane.

DETAILED DESCRIPTION OF THE DRAWINGS

Referring to FIG.1 and 2, the laser level with adjustable laser projection line 100 of the present invention comprises a support bracket 1, a left clamshell housing member 2, a right clamshell housing member 3, a laser protection door 4, a laser generator 10 mounted on the front bracket 1B of the support bracket 1, a battery pack 11 or power supply to power the laser generator 10, a switch 41 to control the laser generator 10 and a cover 6 for the battery pack. The protective door 4 can trigger the switch 41 when it is opened or closed, as shown in FIG. 1. As the door 4 is in the closed position, it slides the switch 41 to the off position and switches off the laser generator 10. The closed door 4 also protects the laser generator 10 and lens 10A against dust. When the door 4 is pushed downwardly to access lens 10A of the laser generator 10, as shown in FIG. 2, the door 4 slides the switch 41 to the on position at the same

time, switching on the laser generator 10 to project a fan-shaped laser beam 13 and form a line 131 on the surface to be illuminated.

Referring now to FIG. 3 and 4, the laser generator 10 in the laser alignment device 100 of the present invention includes a rotating mechanism 5, which can have a knob 51 secured on the laser generator 10 which will rotate along with the rotation of knob 51. When knob 51 is turned clockwise to its limit, the planar beam projected by the laser generator 10 will be parallel to the bottom of laser level 100 (FIG. 4); and, when knob 51 is turned counterclockwise to its limit (the angular degree of rotation preferably being 90 degrees), the planer beam projected by the laser generator 10 will be perpendicular to the bottom of the laser alignment device 100 (FIG. 3). To avoid knob 51 from rotating arbitrarily and affecting the stability of the laser beam position accordingly, it is preferred to arrange two magnetic members 52, 53 on knob 51, and arrange two fastening members 54, 55 on the corresponding position of the front bracket 1B. When the knob 51 being rotated to its clockwise limit, the fastening member 54 is caught by the magnetic member 53; and when knob 51 rotates to its counterclockwise limit, the fastening member 55 is caught by the magnetic member 52, ensuring the position of knob 51 and thereby maintaining the stability of the laser beam position.

Referring to FIG. 1 and 2, the laser alignment device 100 of the present invention may advantageously comprise one or more leveling devices such as bubbles 8, 9 to orientate or level the laser level 100 on a horizontal or vertical plane. The leveling bubbles 8, 9 are parallel to the bottom of the laser level 100. Bubble 8 is used to level the horizontal relationship of the elongated side position of the laser level with adjustable laser projection line 100, and bubble 9 is used to level the horizontal relationship of fore-and-aft position of the laser level 100. Thus, laser level 100 can provide accurate horizontal lines and plumb lines with the usage of the level bubbles 8, 9.

The laser level with adjustable laser protection line 10 as described above can also be used on a horizontal position for a metallic surface. To solve this problem, as shown in FIG. 2, a magnet 12 is mounted on the base 1A of the support bracket 1 of the laser level 100, thereby allowing laser alignment device 100 to be placed and held on an arbitrary portion of the metallic surface.

To position laser level 100 on a wood, plastic, drywall or other surface, as shown in FIG. 1, a removable baseplate 7 may be used with the laser level 100 for mounting. As shown in FIG. 5, the baseplate 7 comprises two pushpads 73 each including at least one retractable positioning pin 72. In the embodiment shown in FIGS. 5-7, there are three retractable pins 72 on each pushpad 73. When pushpads 73 are relaxed, the retractable pins 72 are retracted within the removable mounting baseplate 7, as shown in FIG. 6, thus preventing the operator from being stabbed carelessly. When pushpads 73 are pressed down, the positioning pins 72 will extend outwardly from the bottom 74 of the mounting baseplate 7 as shown in FIG. 7. The mounting baseplate 7 can be mounted to the surface of a wall (drywall, plastic, plaster or other surface) by inserting the retractable pins 72 into the surface. The laser level 100 can then be attached to the mounting baseplate 7 by placing the magnet 12 on the bottom of the laser level 100 to a metallic attachment surface 71 on the mounting baseplate 7 thereby fastening the laser level 100 to the baseplate 7.

FIG. 8 is a perspective view of the laser alignment device 100 when it is situated on the vertical plane with the laser beam projecting downwardly.